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(71) Applicant *(for all designated States except US)*: **EXXONMOBIL UPSTREAM RESEARCH COMPANY** [US/US]; Corp-URC-SW-359, P.O.Box 2189, Houston, TX 77252-2189 (US).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **HOLL, James, E.** [US/US]; 7807 Hickory Mill Court, Houston, TX 77095 (US). **CHENG, Yao-chou** [US/US]; 13839 Cherry Hollow Lane, Houston, TX 77082 (US). **DOBIN, Mark, W.** [US/US]; 19 Clarion Ridge, The Woodlands, TX 77382 (US). **SCHUETTE, John, F.** [US/US]; 1 Twin Circle Drive, Houston, TX 77042 (US). **KIM, Chul-sung** [US/US]; 8411 Hunters Creek Drive, Houston, TX 77024 (US). **SCHMIDTKE, Eric, A.** [US/US]; 2034 Wroxton Road, Houston, TX 77005 (US).

(74) Agent: **JENSEN, Nathan, O.**; Exxonmobil Upstream Research Company, Corp-URC-sW-359, P.O.Box 2189, Houston, TX 77252-2189 (US).

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(54) **Title**: FUNCTIONAL-BASED KNOWLEDGE ANALYSIS IN A 2D AND 3D VISUAL ENVIRONMENT

(57) **Abstract**: A method of creating a visual display based on a plurality of data sources is provided. An exemplary embodiment of the method comprises extracting a set of extracted data from the plurality of data sources and processing at least a portion of the extracted data with a set of knowledge agents according to specific criteria to create at least one data assemblage. The exemplary method also comprises providing an integrated two-dimensional/three- dimensional (2D/3D) visual display in which at least one 2D element of the at least one data assemblage is integrated into a 3D visual representation using a mapping identifier and a criteria identifier.

WO 2009/131762 A2

2008EM118-PCT

FUNCTIONAL-BASED KNOWLEDGE ANALYSIS IN A 2D AND 3D VISUAL ENVIRONMENT

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Patent Application 61/125,088 filed April 22, 2008 entitled **FUNCTIONAL-BASED KNOWLEDGE ANALYSIS IN A 2D AND 3D VISUAL ENVIRONMENT**, the entirety of which is incorporated by reference herein.

FIELD OF THE INVENTION

[0002] The present invention relates to improving the creation of visualizations of data. In particular, an exemplary embodiment of the present invention relates to a system and method for integrating a wide range of data sources and producing an integrated two-dimensional (2D)/three-dimensional (3D) visual display based on the data.

BACKGROUND OF THE INVENTION

[0003] Three-dimensional model construction and visualization has been widely accepted by numerous disciplines as a mechanism for analyzing, communicating, and comprehending complex 3D relationships. Examples of structures that can be subjected to 3D analysis include the earth's subsurface, facility designs and the human body.

[0004] An architecture known in the art as a data flow pipeline has been used by the research institutes and industries in computational environments to facilitate visual programming for building algorithmic pipelines. Commercial and research products such as AVS/Express provided by Advanced Visual Systems (www.avs.com) and SCIRun provided by the Scientific Computing and Imaging Institute (software.sci.utah.edu/scirun.html) utilize data flow pipelines to provide 3D representations of data. Both AVS/Express and SCIRun also provide user interface components that allow the assembly of computational elements for graphic rendering and viewing manipulation of a 3D display.

[0005] Graphic icons have been used in data files commonly referred to as "web pages" because of the accessibility of such data files via the World Wide Web (WWW). Graphic plots may convey a graphic abstraction of data and provide inference handlers (linkages) to

related information on the World Wide Web environment as well as 3D graphic display. One example of the use of graphical images web pages is disclosed in U.S. Patent No. 5,708,764 to Borrel et al., the contents of which are hereby incorporated by reference as though fully set forth herein. The interconnected network of the information in this kind of architecture provides convenient ways to represent a snap shot of the underlying data model which allows users to navigate the information interactively. The graphic icons in the display window also permit the user to select additional displays showing detailed information in the corresponding network model.

[0006] In the field of artificial intelligence research, multi-agent technology has been used to provide a framework for designing and implementing software systems. One example of the use of multi-agent technology in this manner is disclosed in Yuji Wada, Masatoshi Shiouchi, Yuji Takada; "A Multi-Agent Approach to a Distributed Schedule Management System"; June 11, 1997, the contents of which are hereby incorporated by reference as though fully set forth herein. In such a system, resources and capabilities are distributed across a network of interconnected agents. The framework has been used in areas such as supply-chain management, collaboration and planning.

[0007] With respect to providing visualizations of data regarding a 3D earth model, the current practices generally relate to processing and visualizing the geological data types such as seismic volumes, a geo-modeling grid, fault surfaces, horizon grids and well data. Many engineering and geoscience data types, however, may be point or non-spatial data, which may be difficult to represent in conjunction with 3D data such as a visualization of a subsurface environment. Examples of such data types include drilling information, daily/monthly production data, geochemical or geomechanical analysis results, production measurements or the like. Effective incorporation of such 2D data into a 3D visual representation has proven to be a challenging problem. An improved system and method that effectively incorporates non-spatial data, point data, observational data, multidimensional data or the like into a 3D visualization is desirable.

SUMMARY OF THE INVENTION

[0008] A method of creating a visual display based on a plurality of data sources is provided. An exemplary embodiment of the method comprises extracting a set of extracted data from the plurality of data sources and processing at least a portion of the extracted data

with a set of knowledge agents according to specific criteria to create at least one data assemblage. The exemplary method also comprises providing an integrated two-dimensional/three-dimensional (2D/3D) visual display in which at least one 2D element of the at least one data assemblage is integrated into a 3D visual representation using a mapping identifier and a criteria identifier.

[0009] In addition, a system for creating a visual display is provided herein. An exemplary embodiment of the system comprises a plurality of data sources. The exemplary system also comprises a data access agent that is adapted to extract a set of extracted data from the plurality of data sources and a set of knowledge agents that are adapted to process the extracted data according to specific criteria to create at least one data assemblage. Further, the exemplary system comprises a display agent that is adapted to provide an integrated two-dimensional/three-dimensional (2D/3D) visual display in which at least one 2D element of at least one data assemblage is integrated into a 3D visual representation using a mapping identifier and a criteria identifier.

[0010] One exemplary embodiment of the present invention is manifested as a tangible machine-readable medium, such as a memory device in a computer system. The exemplary tangible machine-readable medium comprises code adapted to extract a set of data from a plurality of data sources and code adapted to correspond to a set of knowledge agents that process at least a portion of the extracted data according to specific criteria to create at least one data assemblage. The exemplary tangible machine-readable medium also comprises code adapted to provide an integrated two-dimensional/three-dimensional (2D/3D) visual display in which at least one 2D element of the at least one data assemblage is integrated into a 3D visual representation using a mapping identifier and a criteria identifier.

[0011] In one exemplary embodiment, the visual display corresponds to a subsurface region. The plurality of data sources may represent a 3D earth model.

[0012] In accordance with the present invention, the set of knowledge agents may comprise at least one data access agent, at least one spatial selection agent, at least one logical selection agent, at least one data mining agent or at least one display agent. In one exemplary embodiment, a visual control panel corresponding to the integrated 2D/3D visual display may be created by storing a state of at least one of the set of knowledge agents.

2008EM118-PCT

[0013] In one exemplary embodiment, the criteria identifier comprises a graphic plot. In another exemplary embodiment, the criteria identifier corresponds to at least one of the specific criteria.

DESCRIPTION OF THE DRAWINGS

[0014] The advantages of the present invention will be better understood by referring to the following detailed description and the attached drawings, in which:

[0015] Figs. 1A and 1B are parts of a block diagram of a multi-agent framework that is adapted to create a visualization of data in a 2D/3D environment in accordance with an exemplary embodiment of the present invention; and

[0016] Fig. 2 is a process flow diagram that shows a method in accordance with an exemplary embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0017] An exemplary embodiment of the present invention effectively combines the ability to present 3D data with other types of data from a variety of sources. One exemplary embodiment of the present invention is adapted for use in providing a visualization of data relating to a 3D shared earth environment. Examples of point or non-spatial data that may be incorporated into such a visualization include drilling information, daily/monthly production data,, geochemical or geomechanical analysis results, production measurements or the like. Such point or non-spatial data types are typically not stored or displayed within a 3D earth model. Instead, the point or non-spatial data tends to be stored in databases or spreadsheets and displayed as 2D diagrams (e.g. XY plots, pie charts or the like). Comprehension of these data types, however, could be improved by effectively and interactively integrating the data into 3D models. Moreover, the usefulness of the data to predict or explain subsurface phenomena and aid in the placement and/or design of surface facilities (for example, drilling/production platforms or reservoir surveillance) could be improved by successfully integrating a representation of the point and/or non-spatial data into a visualization of a 3D earth model.

[0018] An exemplary embodiment of the present invention relates to a system and method for linking engineering and geoscience data dynamically. In addition, such an exemplary embodiment provides an opportunity for geoscientists and engineers to assemble data analysis processes such as data mining, statistical analysis, time-dependent data analysis,

quantitative analysis of uncertainty or the like to make better decisions within a 3D shared earth environment.

[0019] Figs. 1A and 1B are parts of a block diagram of a multi-agent framework that is adapted to create a visualization of data in a 2D/3D visual environment in accordance with an exemplary embodiment of the present invention. The block diagram is generally referred to by the reference number **100**. The block diagram **100** depicts a computer system **101** that is adapted to support the execution of a plurality of agents that have different functions with respect to processing data about a particular 2D/3D visual environment. Those of ordinary skill in the art will appreciate that the computer system **101** may comprise a single CPU system or a multi-computer network, including a distributed network. In addition, the computer system **101** comprises at least one tangible machine-readable medium, which may be a memory device. An exemplary embodiment of the present invention is adapted to receive data from a variety of sources. For example, the computer system **101** may be adapted to receive data from a database **102**, an application program **103** and/or an external file **104**. Examples of data that may be provided to the computer system include seismic survey volumes, geological/geophysics data, time-variant data, geological/reservoir modeling results, well data, drilling profiles, production data, completion information or the like, to name just a few examples.

[0020] The computer system **101** is adapted to support the operation of a multi-agent framework that includes a plurality of different types of knowledge agents, each type of knowledge agent being adapted to perform a different role in knowledge analysis of data about a 2D/3D environment. In the exemplary embodiment shown in Figs. 1A and 1B, the multi-agent framework comprises a data access agent **105**, a spatial selection agent **106**, a data mining agent **107**, a logical selection agent **108**, a first display agent **109**, a second display agent **110**, a third display agent **111** and a fourth display agent **117**, which may be collectively referred to as "the plurality of knowledge agents." Those of ordinary skill in the art will appreciate that other types of data agents may be created depending on a particular knowledge analysis need. An exemplary embodiment of the present invention may facilitate data integration by allowing a user to create and control the topology of the plurality of networked knowledge agents.

[0021] In one exemplary embodiment of the present invention the plurality of knowledge agents are implemented in a decentralized, loosely coupled manner. Each individual knowledge agent is adapted to perform specific tasks (or functions) such as data analysis,

knowledge acquisition, data mining, data visualization or the like. The plurality of knowledge agents interact with each other by passing commands and information that creates dynamic links between them. In one exemplary embodiment of the invention related to creating visualizations of a subsurface environment, one or more 2D/3D display windows may be created to convey or annotate the various images which may comprise basic display elements such as horizon surfaces, well trajectories, production history charts or the like.

[0022] Each of the plurality of knowledge agents may employ unique local states and interfaces. In one exemplary embodiment, the plurality of knowledge agents can be constructed to form a direct graph topology to allow a workflow to be processed sequentially. One or more display agents may be used as end-nodes in the workflow to convey the display object in 2D/3D visual environment. In another exemplary embodiment, automatic schedule management may be employed to allow the network topology to be adjusted based on the data processing or data mining results.

[0023] In the exemplary embodiment of the invention depicted in Figs. 1A and 1B, a user has configured to plurality of knowledge agents to perform an analysis of reservoir surveillance using production history and simulation data to predict/anticipate production/contact movement in an oil field. In particular, the user has defined the database **102**, the application **103** and the external file **104** as sources of data. The data sources defined by the user may relate to production/injection wells, production history or geological database information to name just a few examples. Data types of interest may include wells and associated production data or events or the like. Data meeting the criteria identified by the user may be obtained by the data access agent **105**. The state of the data access agent **105** can be saved to facilitate data retrieval/analysis in subsequent sessions.

[0024] Extracted data retrieved by the data access agent **105** is delivered to the data mining agent **107** via a data path A for comparison to other data populations received from other sources. For example, the data mining agent **107** may be adapted to analyze received data for the purpose of identifying all producing wells within the field with related geological/reservoir control information.

[0025] Alternately or in parallel with the evaluation of the extracted data by the data mining agent **107**, the extracted data may also be delivered via a data path B to the spatial selection agent **106** to identify potential geological controls affecting the connectivity of wells in the field. By way of example, the user may program the spatial selection agent **106** to identify wells having connection to a set of specific compartments or a particular reservoir.

2008EM118-PCT

The results of this analysis could be treated as a new data assemblage that could be delivered to the data mining agent **107**, as shown in Figs. 1A and 1B. In one exemplary embodiment of the present invention, the data assemblage produced by the spatial selection agent **106** represents injection/producing wells with known connect pathways. The data mining agent **107** could be programmed to compare oil and gas producing rates as well as factors affecting the connect movement.

[0026] Also alternately or in parallel with the operation of the data mining agent **107**, the extracted data may be delivered to the logical selection agent **108** via a data path C. In the exemplary embodiment shown in Figs. 1A and 1B, the logical selection agent **108** is adapted to create a new data assemblage representing a subset of all production data within the time period of the analysis. This data assemblage could be passed to the data mining agent **107** for comparison with other data assemblages to observe production trends for monitored wells.

[0027] The data mining agent **107** may be adapted to analyze/compare any of the generated data assemblages. For example, data retrieved in by the data access agent **105** and delivered directly to the data mining agent **107** (all wells and models and geological control), the data assemblage generated by the spatial selection agent **106** (compartments, wells and connectivity information), and the data assemblage produced by the logical selection agent **108** (wells with monthly production data) can be assembled and analyzed by the data mining agent **107** to assist in identifying relationships (e.g. contact movement related producing wells in the compartment) that can be used to explain and potentially predict future production and injection/producing configurations.

[0028] In the exemplary embodiment shown in Figs. 1A and 1B, the data assemblage produced by the data access agent **105** is delivered to the first display agent **109**. The first display agent **109** may be adapted to display this data as various geological object types such as faults, horizons and wells. The first display agent **109** may be programmed to display this data via a display path E using geographic mapping to represent a 3D earth model environment. The data assemblage produced by the logical selection agent **108** is delivered to the second display agent **110**. The second display agent **110** may represent this data via a display path F in the form of time-animated pie charts. The time-animated pie charts may be used to convey monthly production data in which perforation zone locations in the wells are used for location mapping in a 3D earth model environment. The third display agent **111** is provided with pressure measurement data for a given well. The comparable 2D data plot may be used by the third display agent **111** to determine a TVD coordinate for data display in the

3D earth model environment to compare with other log properties of a given well. This information may be displayed via a display path G.

[0029] The collective outputs from the first display agent **109**, the second display agent **110** and the third display agent **111** create a 2D/3D visual representation **112** corresponding to a subsurface region. In addition to merely portraying the subsurface region, the integrated 2D/3D visual representation **112** may comprise integrated 2D data based on information collected by the plurality of knowledge agents. In the exemplary embodiment shown in Figs. 1A and 1B, the integrated 2D/3D visual representation **112** comprises a plurality of mapping identifiers. Examples of mapping identifiers are given the reference numbers **113** and **114** in Fig. 1B. The mapping identifiers **113** and **114** are in turn associated with criteria identifiers. In Fig. 1B, the mapping identifier **113** is associated with a criteria identifier **115** and the mapping identifier **114** is associated with a criteria identifier **116**.

[0030] In one exemplary embodiment of the present invention, the criteria identifiers **115** and **116** correspond to 2D data objects identified by the plurality of knowledge agents. Moreover, the criteria identifiers **115** and **116** may represent such 2D data as an expected proportion of oil, gas or water at a particular location or the like. The representation of 2D data in the integrated 2D/3D visual representation **112** reflects the state of information intended to be integrated and conveyed by the specific configuration of the plurality of knowledge agents. In other words, the 2D information integrated into the integrated 2D/3D visual representation **112** represents specific criteria for which a user has configured the plurality of knowledge agents to examine the data obtained from the database **102**, the application **103** and/or the external file **104**.

[0031] In one exemplary embodiment of the present invention, the criteria identifiers **115** and **116** comprise iconic graphics or other graphic plots that are displayed to convey non-spatial data related to specific criteria without a static linkage attached to them. Instead, for deeper investigation of a specific data object corresponding to the criteria identifiers **115** and **116**, the local state of the knowledge agents may be altered to retrieve and process new information and to display updated results in the same or separate display windows. Those of ordinary skill in the art will appreciate that a state of a visual control panel associated with the first display agent **109**, the second display agent **110** and the third display agent **111** could be saved so that with each new session the data is automatically retrieved, processed, and displayed according to the user defined process flow.

2008EM118-PCT

[0032] In an alternative embodiment of the present invention, the knowledge agents associated with retrieval and analysis could work in the background (even if the display agents are not running) to constantly update perceived relationships (wisdom) as new data becomes available for processing and analysis. For example, as new information on drilling events within a field is obtained, the previously inferred relationship between faults and drilling events could be evaluated. In one exemplary embodiment of the present invention, data collected in real-time (e.g. production data) could be analyzed using the process flow (tools/agent assemblage) to reflect and determine the action to be taken during the reservoir surveillance process.

[0033] In the exemplary embodiment of the invention illustrated in Figs. 1A and 1B, the output data produced by the data mining agent **107** and the logical selection agent **108** is delivered to the fourth display agent **117**, which is adapted to provide a 2D representation **118** based on information obtained by the plurality of knowledge agents via a display path D. The 2D representation **118** may relate to the integrated 2D/3D visual representation **112** or may relate to other aspects of the information obtained by the plurality of knowledge agents. In the exemplary embodiment shown in Fig. 1B, the 2D representation **118** represents cumulated oil, gas and water with time data using a 2D line chart display and an XY mapping function to show the relationship of three kinds of data types: actual data, predicted data and simulated data. Those of ordinary skill in the art will appreciate that a state of a visual control panel associated with the fourth display agent **117** could be saved so that with each new session the data is automatically retrieved, processed, and displayed according to the user defined process flow.

[0034] Fig. 2 is a process flow diagram that shows a method in accordance with an exemplary embodiment of the present invention. The method is generally referred to by the reference number **200**.

[0035] At block **201**, data is extracted from one or more sources. As set forth above, the sources of data may comprise a wide range of formats such as database entries, web services, video input devices, real-time data collection processes or the like. The data may comprise any relevant data about a 2D/3D visual environment such as a shared earth environment. In one exemplary embodiment of the present invention, the data may be extracted from drilling information, daily/monthly production data, production history, exploration data and/or wellbore data to name just a few examples. The types of data included may include spatial data as well as non-spatial data such as temporal data. In one exemplary embodiment of the

present invention, the data is extracted by a data access agent such as the data access agent **105** (Fig. 1A).

[0036] At block **202**, at least a portion of the extracted data is processed by a set of knowledge agents according to specific criteria. As set forth above, the knowledge agents may comprise one or more spatial selection agents, one or more logical selection agents and/or one or more data mining agents. The knowledge agents may be configured by a user to identify data having specific characteristics relative to each other. As one example, the knowledge agents may be configured to analyze the data to determine occurrences of a particular data characteristic. Those of ordinary skill in the art will appreciate that the set of knowledge agents may be adapted to provide one or more assemblages of data based on the extracted data and the conditions provided to the knowledge agents by a user. Moreover, the knowledge agents may be adapted to accept commands from users, send/receive messages triggered by other events where specified conditions are met, or by user events (such as mouse clicking) in a 3D display window.

[0037] At block **203**, an integrated 2D/3D visual display such as the integrated 2D/3D visual representation **112** (Fig. 1B) is provided based on at least a portion of the extracted data. In one exemplary embodiment of the present invention, the integrated 2D/3D visual display represents in part an earth model of a subsurface region. The integrated 2D/3D visual display may be provided by a display agent such as the first display agent **109**, the second display agent **110** and the third display agent **111** (Fig. 1A). In one exemplary embodiment of the present invention, 2D components of the extracted data are indicated by a mapping identifier that identifies a location in the 3D spatial data and a criteria identifier that associates at least one specific criterion with the location indicated by the location identifier. The presentation of the 2D data in the 3D visual representation may be made in a wide range of forms. Examples of how the 2D data may be integrated include text, a map, 2D plots, icons, animated icons, spreadsheet data, web pages or the like.

[0038] Those of ordinary skill in the art will appreciate that one or more of the data assemblages produced by the set of knowledge agents may be used as input data for successive iterations of processing by one or more of the set of knowledge agents.

[0039] In one exemplary embodiment of the present invention, a visual control panel is created to easily recreate or update the integrated 2D/3D visual representation by users such as geoscientists or engineers. The visual control panel may embody a stored state of one or more of the set of knowledge agents. Those of ordinary skill in the art will appreciate that

the visual control panel could be described by a directed graph similar to traditional computational steering environments or by loosely coupled processing agents.

[0040] Those of ordinary skill in the art will appreciate that one advantage that may be obtained using an exemplary embodiment of the present invention includes allowing the assembly of geological and engineering information, and spatial and temporal data in a processing stream. In addition, an exemplary embodiment of the present invention may allow a user to avoid the creation of static associations within graphic objects. Finally, an exemplary embodiment of the present invention may allow knowledge analysis and knowledge acquisition to be included in the processing stream.

2008EM118-PCT

CLAIMS

What is claimed is:

1. A method of creating a visual display based on a plurality of data sources, the method comprising:

extracting a set of extracted data from the plurality of data sources;

processing at least a portion of the extracted data with a set of knowledge agents according to specific criteria to create at least one data assemblage; and

providing an integrated two-dimensional/three-dimensional (2D/3D) visual display in which at least one 2D element of the at least one data assemblage is integrated into a 3D visual representation using a mapping identifier and a criteria identifier.

2. The method recited in claim 1, wherein the visual display corresponds to a subsurface region.

3. The method recited in claim 1, wherein the plurality of data sources represent a 3D earth model.

4. The method recited in claim 1, wherein the set of knowledge agents comprises at least one data access agent.

5. The method recited in claim 1, wherein the set of knowledge agents comprises at least one spatial selection agent.

6. The method recited in claim 1, wherein the set of knowledge agents comprises at least one logical selection agent.

7. The method recited in claim 1, wherein the set of knowledge agents comprises at least one data mining agent.

8. The method recited in claim 1, wherein the set of knowledge agents comprises at least one display agent.

9. The method recited in claim 1, comprising creating a visual control panel corresponding to the integrated 2D/3D visual display by storing a state of at least one of the set of knowledge agents.

10. The method recited in claim 1, wherein the criteria identifier comprises a graphic plot.

11. The method recited in claim 1, wherein the criteria identifier corresponds to at least one of the specific criteria.

2008EM118-PCT

12. A system for creating a visual display, the system comprising:

a plurality of data sources;

a data access agent that is adapted to extract a set of extracted data from the plurality of data sources;

a set of knowledge agents are adapted to process the extracted data according to specific criteria to create at least one data assemblage; and

a display agent that is adapted to provide an integrated two-dimensional/three-dimensional (2D/3D) visual display in which at least one 2D element of the at least one data assemblage is integrated into a 3D visual representation using a location identifier and a criteria identifier.

13. The system recited in claim 12, wherein the visual display corresponds to a subsurface region.

14. The system recited in claim 12, wherein the plurality of data sources represent a 3D earth model.

15. The system recited in claim 12, wherein the set of knowledge agents comprises at least one data access agent.

16. The system recited in claim 12, wherein the set of knowledge agents comprises at least one spatial selection agent.

17. The system recited in claim 12, wherein the set of knowledge agents comprises at least one logical selection agent.

18. The system recited in claim 12, wherein the set of knowledge agents comprises at least one data mining agent.

19. The system recited in claim 12, comprising a visual control panel corresponding to the integrated 2D/3D visual display, the visual control panel including a stored state of at least one of the set of knowledge agents.

20. The system recited in claim 12, wherein the criteria identifier comprises a graphic plot.

21. The system recited in claim 12, wherein the criteria identifier corresponds to at least one of the specific criteria.

22. A tangible machine-readable medium, comprising:

code adapted to extract a set of extracted data from a plurality of data sources;

code adapted to correspond to a set of knowledge agents that process at least a portion of the extracted data according to specific criteria to create at least one data assemblage; and

code adapted to provide an integrated two-dimensional/three-dimensional (2D/3D) visual display in which at least one 2D element of the at least one data assemblage is integrated into a 3D visual representation using a mapping identifier and a criteria identifier.

23. The tangible machine-readable medium recited in claim 22, wherein the integrated 2D/3D visual display corresponds to a subsurface region.

24. The tangible machine-readable medium recited in claim 22, wherein the set of knowledge agents comprises at least one data access agent, at least one spatial selection agent, at least one logical selection agent or at least one data mining agent.

25. The tangible machine-readable medium recited in claim 22, wherein the code adapted to provide an integrated 2D/3D visual display comprises a display agent.

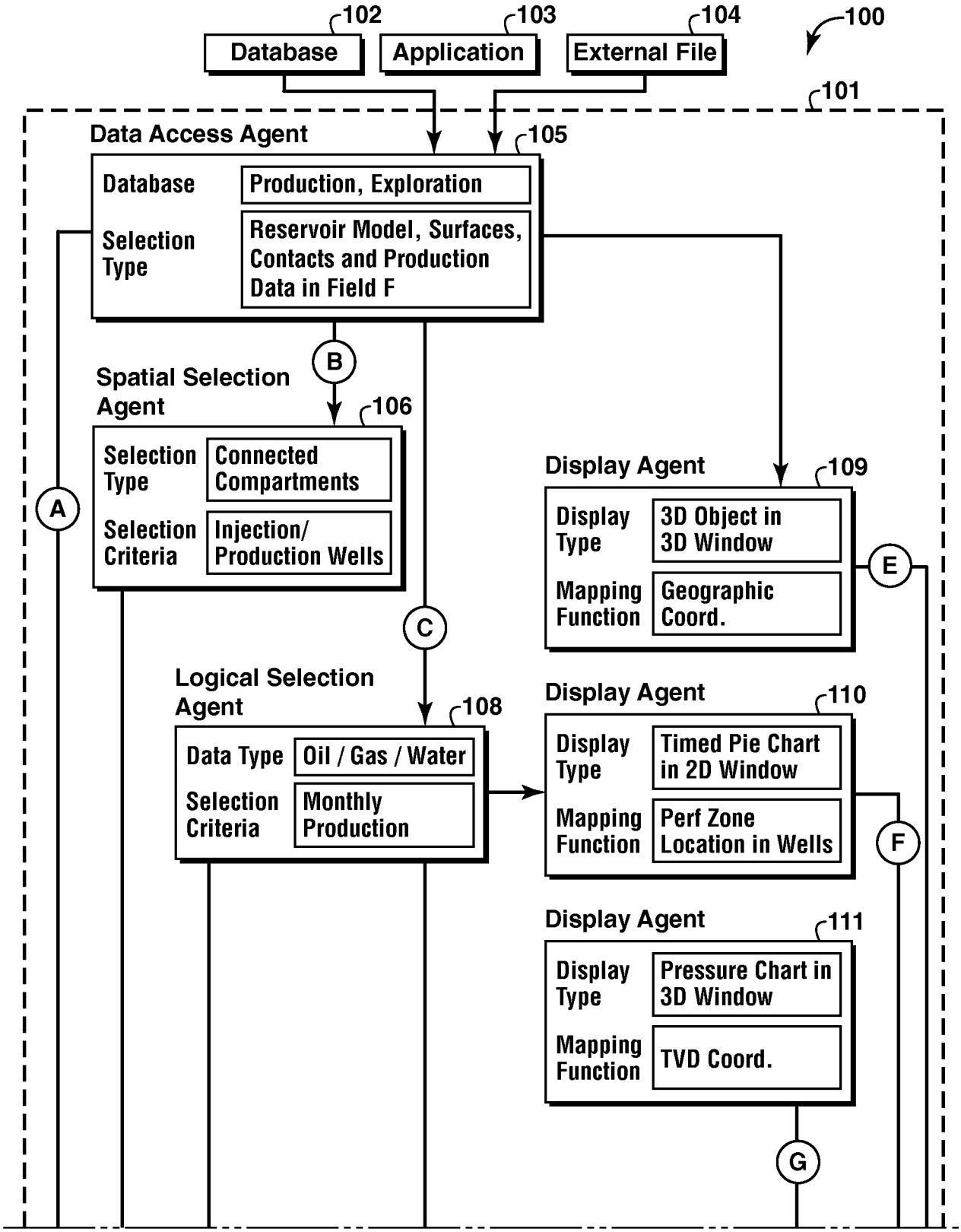


FIG. 1

FIG. 1A

FIG. 1B

FIG. 1A

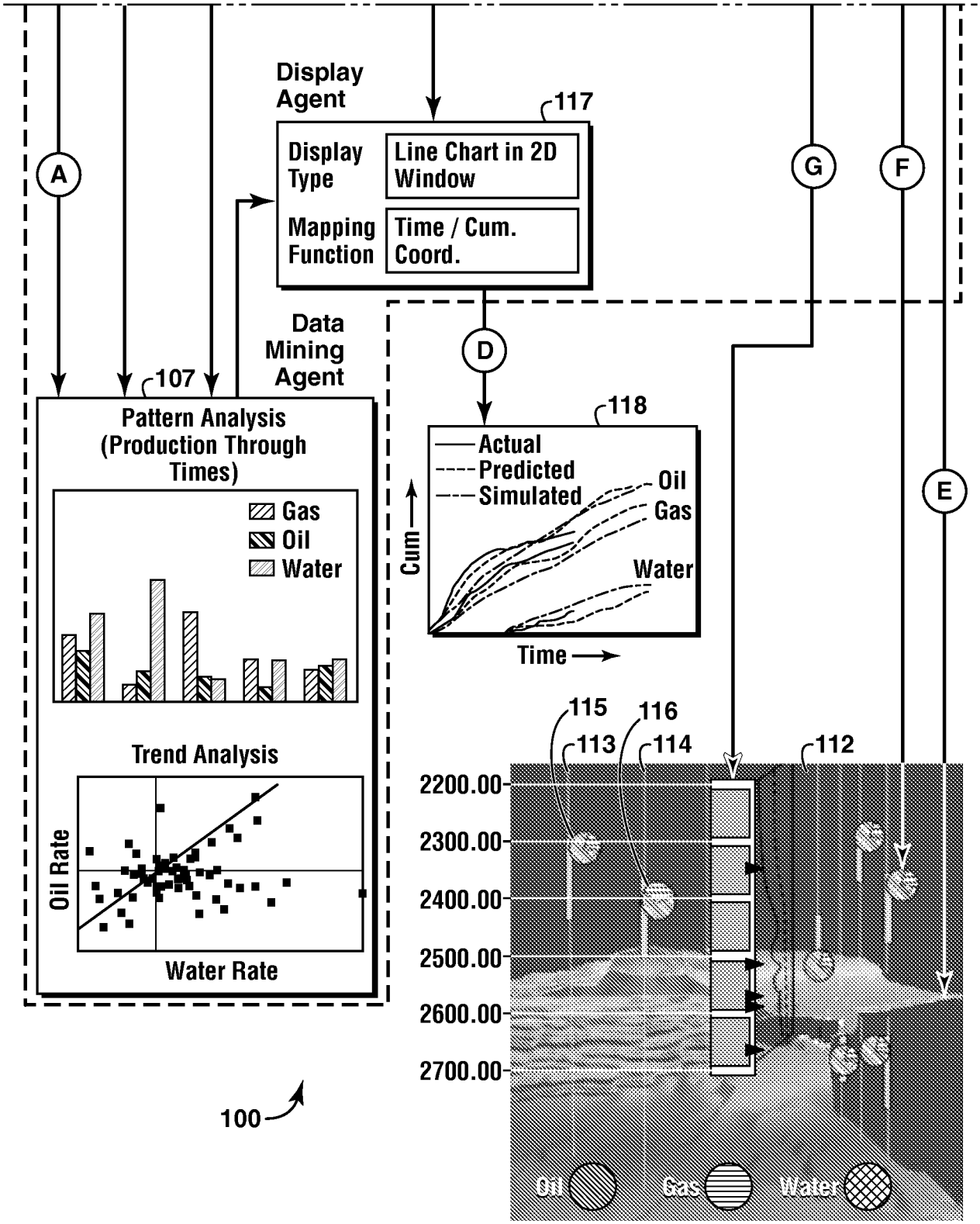

Display Agent
117
Display Type
Line Chart in 2D Window
Mapping Function
Time / Cum. Coord.
A
G
F
E
D
Data Mining Agent
107
Pattern Analysis (Production Through Times)
Gas
Oil
Water
Trend Analysis
Oil Rate
Water Rate
118
Actual
Predicted
Simulated
Oil
Gas
Water
Cum
Time
115
116
113
114
112
2200.00
2300.00
2400.00
2500.00
2600.00
2700.00
Oil
Gas
Water
100

FIG. 1B

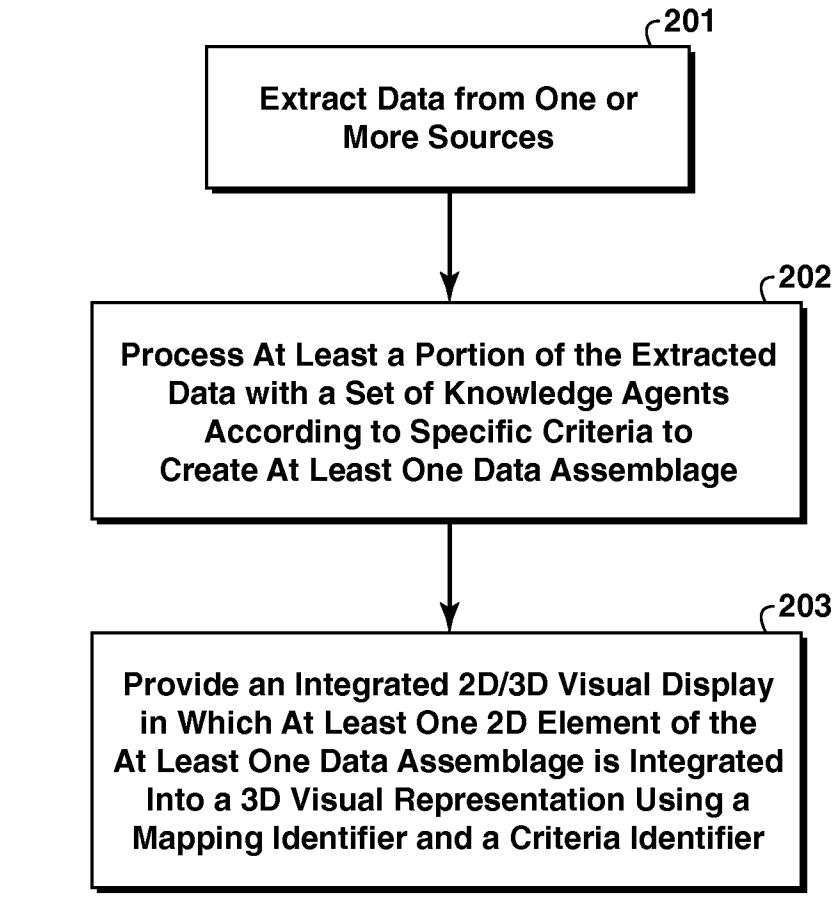

200
201
Extract Data from One or More Sources
202
Process At Least a Portion of the Extracted Data with a Set of Knowledge Agents According to Specific Criteria to Create At Least One Data Assemblage
203
Provide an Integrated 2D/3D Visual Display in Which At Least One 2D Element of the At Least One Data Assemblage is Integrated Into a 3D Visual Representation Using a Mapping Identifier and a Criteria Identifier

FIG. 2